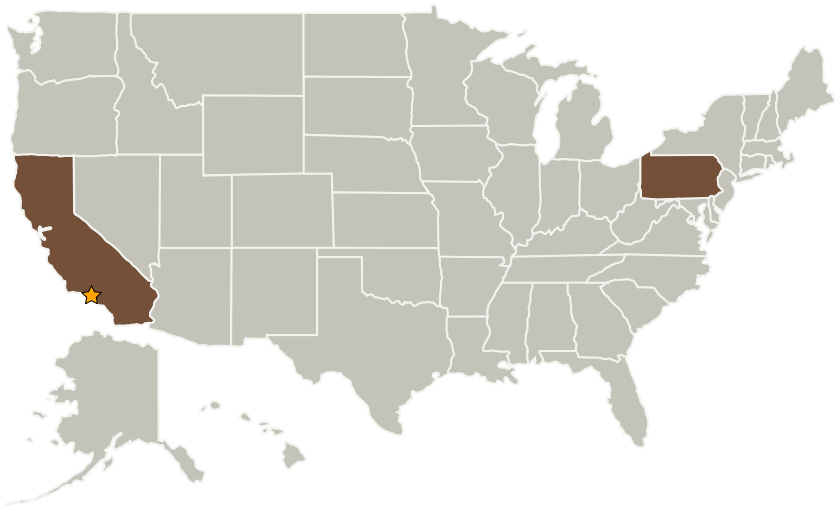
Advanced Actuator Concepts for High Precision Deformable Mirrors, Phase I

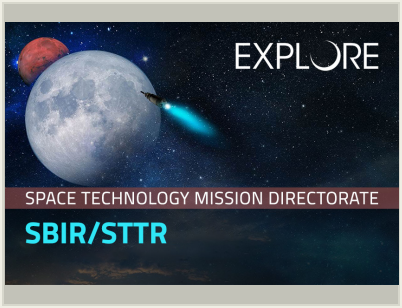
Completed Technology Project (2004 - 2004)

Project Introduction

TRS Technologies proposes to develop a variety of single crystal actuators for adaptive optics deformable mirrors. Single crystal piezoelectric actuators are proposed as a means of increasing actuator authority while maintaining strain precision for adaptive optics deformable mirrors used in future space observatory missions. Single crystals based on PZN-PT or PMN-PT represent a revolutionary advance in piezoelectric actuator technology. These materials exhibit 5 to 10 times the strain of conventional ceramic piezoelectrics with equivalent deliverable force. Therefore, they offer a much broader design space for adaptive optics systems than is currently available with ceramic actuators, electric motors or magnetic devices. The attributes of single crystals relevant to adaptive optics include: piezoelectric coefficients > 2000 pm/V and field induced strains > 0.5%, blocking forces equivalent to conventional piezoelectric and electrostrictive ceramic, very low strain-electric field hysteresis for high strain precision, much broader operating temperature range than electrostrictive PMN ceramic, very good cryogenic performance, and very high transverse piezoelectric coefficients (d32 better than -1600 pm/V). In the Phase I program TRS will measure the performance of both stack and flextensional-type actuators and SRS will model the impact of incorporating such actuators into state-of-the-art deformable mirror designs.

Primary U.S. Work Locations and Key Partners





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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Jet Propulsion Laboratory (JPL)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★Jet Propulsion Laboratory(JPL)	Lead Organization	NASA Center	Pasadena, California
TRS Ceramics, Inc.	Supporting Organization	Industry	State College, Pennsylvania

Primary U.S. Work Locations	
California	Pennsylvania

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Paul Rehrig

Technology Areas

Primary:

- TX14 Thermal Management Systems
  - TX14.2 Thermal Control Components and Systems
    - TX14.2.8 Measurement and Control